Meteorological record of voluntary observers and Army post surgeons, November, 1886.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature. Maximum.	Minimum.	Mean.	Rainfall.
Alabama.	°	°	°	*Inches*
Greensborough	74	31	54.3	4.53
Livingston	79	31	53.2	3.78
Mount Vernon B'ks.	81	27	57.3	7.03
Arizona.				
Huachuca, Fort	79	15	54.4	trace
Lowell, Fort	86	15	53.8	0.12
McDowell, Fort	89	22	53.9	0 30
Tucson				0.45
Arkansas.				
Lead Hill	79	19	45.2	3.49
California.				
Alcatraz Island	72	44	54.4	1.02
Anderson	86	30	49.0	0.50
Angel Island	82	39	55.5	0.73
Benicia Barracks	69	39	52.6	0.36
Bidwell, Fort	59	11	35.5	0.47
Cahuenga				0.72
Hydesville				1.97
Mason, Fort	68	47	54.7	0.72
Nicolaus	76	31	52.0	0.04
Oakland	69	38	52.2	0.45
Oroville	76	31	53.8	0.29
Poway	83	28	54.1	1.50
Presidio of San F	74	41	54.3	0.48
Princeton	83	26	49.6	0.02
Riverside	84	27	51.5	0.53
Sacramento	68	27	46 0	0.11
Salinas	80	30	49.2	0.82
Santa Barbara	83	38	56.3	0.87
Santa Maria	85	32	56.0	0.59
Colorado.				
Lewis, Fort	59	—13	27.6	1.74
Connecticut.				
Bethel				4.41
Hartford	65	18	40.8	6.32
North Colebrook	64	12	35.2	2.55
Voluntown	68	24		4.30
Dakota.				
Abr. Lincoln, Fort	63	—11	24.7	0.40
Henry	58	— 3	24.0	0.49
Meade, Fort	60	—13	30.6	1.60
Pembina, Fort	58	—20	18.9	3.80
Randall, Fort	67	1	32.3	1.04
Richardton	58	— 3	25.1	0.80
Sisseton, Fort	60	—17	24.4	0.96
Sully, Fort	66	1	30.8	1.72
Totten, Fort	54	—12	20.8	0.65
Vermillion	72	— 1		2.50
Webster	63	—16	23.0	4.33
Yates, Fort	61	—21	26.9	0.58
District of Columbia.				
Kendall Green*	68	23	50.4	2.44
Florida.				
Archer*	86	32	60.7	1 08
Alva*	82	43	62.0	0.30
Meade, Fort				0.40
Limona*	88	42	66.1	1.02
Manatee	88	42	66.0	0.92
Tallahassee	79	33	57.4	2.20
Georgia.				
Athens	72	27	50.4	3.61
Forsyth*	82	33	56.4	4.55
Milledgeville	79	29	52.8	2.88
Quitman	79	32		1.90
Idaho.				
Boisé Barracks	61	10	35.3	0.36
Cœur d'Alene, Fort	59	0	31.9	1.52
Illinois.				
Anna*	74	22	44.2	6.65
Collinsville	73	18	45.5	2.74
Charleston*	74	14	38.9	3.86
Geneseo*	73	9	34.3	0.76
Mattoon*	76	15	40.5	2.65
Pekin*	72	11	38.6	0.87
Peoria	72	17	29.6	1.34
Riley	65	9	31.3	0.98
Rockford	67	12	32.9	1.61
Sandwich	70	11	34.6	1.47
South Evanston	71	9		0.96
Sycamore	67	9	32.1	0.96
Windsor	72	16	38.2	2.37
Indian Territory.				
Gibson, Fort	79	10	47.2	0.50
Supply, Fort	75	6	42.8	0.10
Indiana.				
Butlerville*	76	17	41.7	4.99
Fort Wayne*	71	18	44.5	3.65
Jeffersonville	73	22	42.7	5.85
Laconia	80	18	41.4	5.42
Lafayette	72	9	37.3	1.87
La Grange	68	14	34.5	2.00
Logansport*	74	16	38.9	3.71
Manzy	67	9	31.6	4.17
Monticello	76	11		0.05
Spiceland				3.00
Sunman*	68	12	37.8	5.10
Terre Haute*	67	18		3.42
Vevay	75	19	42.7	4.54

Stations.	Temperature. Maximum.	Minimum.	Mean.	Rainfall.
Iowa.	°	°	°	*Inches*
Bancroft	71	— 4	27.6	1.90
Cedar Rapids *a*	69	8	33.6	1.50
Cedar Rapids *b*	68	1	30.8	0.90
Clinton	75	7	33.0	1.00
Cresco	65	— 1	26.8	1.86
Des Moines	70	5	35.1	
Independence*	64	8	31.3	0.96
Logan	74	3	31.3	2.30
Monticello*	68	6	31.7	1.35
Mount Vernon	70	6	33.2	
Muscatine	72	9	33.7	0.95
Oskaloosa *a**	72	8	31.4	1.30
Oskaloosa *b**	70	6		
West Union	70	2	29.2	1.36
Kansas.				
Allison	67	1	30.5	1.05
Belleville	70	17	43.3	0.88
Elk Falls				0.66
El Dorado	73	12	41.9	0.51
Emporia	74	15	41.1	0.98
Globe	76	12	39.0	1.57
Hays, Fort	75	— 4	36.5	0.68
Independence*	74	13	43.9	1.70
Manhattan *a*	80	8	35.7	1.30
Manhattan *b*	79	12	40.6	1.24
Minneseah	73	13	40.5	0.18
Riley, Fort	77	10	39.8	0.80
Salina	64	18	40.9	0.07
Wellington	70	5	43.2	0.10
West Leavenworth	77	16		3.00
Westmoreland*	77	10	36.0	0.56
Wakefield	75	16	39.5	1.06
Wyandotte	76	12	39.9	1.26
Yates Centre	73	11	38.8	1.34
Kentucky.				
Bowling Green	73	39		
Frankfort	70	16	41.8	6.18
Richmond	70	19	42.6	4.34
Louisiana.				
Grand Coteau	79	32	57.5	2.94
Liberty Hill				3.01
Maine.				
Bar Harbor	58	24		5.74
Cornish*	62	14	35.2	4.78
Gardiner	61	18	37.7	6.66
Kent's Hill	60	14	35.1	4.35
Orono*	58	14	37.0	8.67
Maryland.				
Emmittsburg	70	20	42.0	2.95
Fallston*	70	23	43.1	4.19
New Midway	72	24	45.3	5.10
McHenry, Fort	70	28	46.4	2.20
Woodstock	68	17	44.0	3.50
Massachusetts.				
Amherst *a*	65	16	38.3	5.25
Amherst *b*	65	24	40.2	4.72
Blue Hill Obs'y	63	22	40.1	3.16
Deerfield	65	17	39.0	5.65
Dudley	68	10	46.6	3.66
Fall River	65	25	43.4	4.90
Heath	64	10		
Milton	62	22	39.4	3.13
New Bedford	62	22	43.3	3.74
North Truro				3.70
Princeton	64	19	37.6	5.55
Somerset*	68	22	43.6	4.49
Taunton	70	21	42.0	3.95
Westborough	70	18	41.7	4.82
Williamstown	65	14	38.9	5.80
Worcester	63	22	38.0	5.19
Michigan.				
Brady, Fort	70	— 4	29.8	1.44
Harrisville*	62	10		2.34
Hudson	70	10		2.15
Kalamazoo	66	11	38.5	1.36
Lansing	68	5	34.0	1.37
Mottville	70	15		0.75
Pentwater	67	—15	34.5	2.91
Thornville	70	9	35.3	2.01
Traverse City	70	3		3.84
Minnesota.				
Minneapolis	68	— 3	26.2	2.48
Snelling, Fort	69	—12	26.8	1.82
Missouri.				
Centreville	71	13		5.83
Central College*	71	17		1.85
Conception	72	8	36.6	1.39
Pierce City	76	17	43.1	1.80
Montana.				
Keogh, Fort	62	—17	31.2	0.40
Missoula, Fort	53	— 8	25.9	0.50
Shaw, Fort	58	—21	33.0	
Nebraska.				
Brownville	74	12	38.9	2.00
Crete	74	6	32.9	0.50
De Soto*	73	4	33.3	1.70
Fremont*	71	8	31.6	1.92
Genoa	70	5	32.2	1.43

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature. Maximum.	Minimum.	Mean.	Rainfall.
Nebraska—Cont'd.	°	°	°	*Inches*
Hay Springs*	54	— 5	26.3	2.19
Lincoln	80	8	34.9	
Marquette				0.79
Niobrara, Fort	65	— 4	29.6	0.60
Robinson, Fort	72	—16?	31.8	1.12
Sidney, Fort	58	— 1	29.2	0.16
Stockham				1.10
Tecumseh	72	8	37.6	0.80
Nevada.				
Carson City	60	4	32.7	0.44
McDermit, Fort	54	10	31.6	0.76
New Hampshire.				
Antrim				6.15
Ashland				6.11
Belmont				4.87
Berlin Mills	60	— 2		
Bristol				6.38
Lake Village				5.22
Nashua	64	16	38.5	4.66
Wier's Bridge				4.63
Wolfborough				5.10
Woodstock				0.13
New Jersey.				
Beverly*	71	22	43.8	4.04
Clayton*	72	20	43.7	5.03
Dover*	76	17	38.9	4.47
Mourestown	73	22	43.0	4.21
Paterson	50	32	43.0	3.85
Roseland				4.02
South Orange	72	26	43.3	4.12
Upper Montclair	67	20	42.9	3.38
Vineland	68	24	44.1	3.80
New Mexico.				
Bayard, Fort	79	17	44.9	0.00
Gallinas Spring	68	24		
Selden, Fort	75	15	45.1	0.60
Union, Fort	65	— 6	35.8	0.35
Wingate, Fort	64	0	31.0	0.40
New York.				
Auburn	65	21	37.9	6.89
Brooklyn	76	29	45.2	3.92
Columbus, Fort	70	27	45.1	4.04
Cooperstown*	64	16	35.5	4 72
Factoryville*	64	9	36.2	4.77
Humphrey	68	15	30.6	6.23
Ithaca	67	15	37.6	6.03
Le Roy	69	12	35.7	5.32
Madison Barracks	65	12	37.3	3.00
Menand	67	20	39.1	5.25
Niagara, Fort	65	22	38.5	2.44
North Volney*	70	21	36.8	
Palermo*	63	18	34.8	4.31
Penn Yan				4.49
Palmyra*	68	18	37.1	
Setauket	67	27	45.4	3.43
West Point	70	19	42.4	4.30
North Carolina.				
Chapel Hill	77	24	49.1	2.79
Flat Rock	67	22	43.8	8.51
Lenoir	66	22		5.90
Lincolnton	67	26	43.7	4.37
Raleigh	78	30	52.0	1.05
Reidsville*	72	15	38.2	1.26
Statesville*	70	25	46.3	5.01
Wake Forest	75	22	51.2	2.11
Ohio.				
Cleveland	71	20	39.0	4.59
College Hill*	83	14	41.8	4.50
Elyria	73	20		4.31
Garrettsville	70	12	34.9	4.94
Hiram	68	18	36.0	5.68
Jacksonborough*	62	18	38.2	4.55
Napoleon	60	19	39.2	2.97
North Lewisburg	69	16	39.5	4.20
Portsmouth	72	23	42.5	5.22
Ruggles*	68	20	37.7	4.60
Tiffin *a**	66	21	37.3	3.49
Tiffin *b**	69	20	35.0	3.47
West Milton	75	16	42.4	6.00
Wauseon	71	17	34.9	2.66
Westerville	67	18	38.2	3.22
Yellow Springs	65	16	38.7	3.11

Stations.	Temperature. Maximum.	Minimum.	Mean.	Rainfall.
Oregon.	°	°	°	*Inches*
Albany*	62	24	43.2	1.75
Bandon*	59	26	43.0	2.27
East Portland*	56	26		1.00
Eola*	54	26	41.1	1.45
Klamath, Fort	68	5	31.1	0.23
Mount Angel*	60	24	41.5	
Pennsylvania.				
Blooming Grove*	70	9	37.4	7.00
Catawissa*	71	8	39.8	5.82
Drifton	69	10	37.2	6.52
Dyberry	61	3	36.6	7.10
Fallsington	71	21	42.1	4.72
Franklin*	62	8	30.9	4.49
Grampian Hills*	64	8	35.2	6.03
Phillipsburg*	63	10	35.1	5.70
Wellsborough*	63	10	39.0	6.50
West Chester	72	20	42.8	4.48
Wilkesbarre	70	13	39.4	5.80
York	85	20		9.50
Zionsville	80	30	42.8	6.06
South Carolina.				
Aiken	78	31	56.0	1.83
Kirkwood*	72	22	48.3	0.92
Pacolet	71	30	48.4	3.04
Spartanburg	61	40	47.7	4.50
Stateburg*	73	30	53.7	0.87
Tennessee.				
Ashwood	72	22	47.0	5.13
Austin	74	19	47.1	6.36
Milan	76	22	46.3	8.65
Texas.				
Austin*	84	24		0.64
Comfort				0.16
Concho, Fort	85	21	52.7	0.00
Corsicana				2.59
Midland	78	19	42.7	
McIntosh, Fort	86	27	59.7	trace
Ringgold, Fort	91	20	65.5	0.48
New Ulm	87	28	58.7	1.50
Silver Falls	78	12		0.03
Vermont.				
Brattleborough	67	14	37.4	5.67
Burlington	67	20	36.1	4.29
Charlotte*	68	20	44.8	5.80
Lunenburg	58	10	33.3	3.90
Newport	62	5	33.5	7.80
Post Mills*	66	— 6	31.2	6.45
Poultney	70	7	36.0	7.75
Strafford	60	22	37.9	4.97
Virginia.				
Accotink	72	22	44.8	2.85
Bird's Nest*	79	29	53.3	2.75
Brulington				4.07
Dale Enterprise*	78	21	44.4	6.46
Monroe, Fort	74	30	52.2	1.55
Rappahannock	80	24	50.3	3.98
Snowville	63	21		4.70
Summit	70	19	44.0	
Variety Mills	69	18	42.5	3.81
Washington Territory.				
Bainbridge Island*	62	28	44.7	1.80
Kenewick	65	8		0.04
Spokane, Fort	63	6	32.3	0.06
Tacoma*	58	29	40.5	1.59
Townsend, Fort	60	28	44.0	1.28
Walla Walla, Fort	71	18	40.4	0.57
West Virginia.				
Clarksburg	71	18	40.8	2.93
Helvetia*	69	17	39.5	4.53
Parkersburg	70	24	40.8	4.78
Wisconsin.				
Beloit	66	10	32.6	1.15
Delavan	63	5	32.4	1.19
Embarras*	68	4	30.4	3.65
Fond du Lac*	67	—12	26.1	1.61
Madison	49	9	31.2	1.21
Manitowoc	56	3	32.9	2.47
Prairie du Chien	70	8	31.5	1.13
Wausau	65	— 3	26.1	2.32
Wyoming.				
Laramie, Fort	53	— 6	30.5	0.55
Washakie	54	—19	23.6	2.29

NOTES AND EXTRACTS.

The following is an extract from the November, 1886, report of the "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The temperature for November was 8°.2 below the normal. In north Alabama the first killing frost occurred on the 7th; while in the extreme southern portions of the state it was as late in the month as the 18th. The frost of the 7th was general over the state, but was light in south Alabama. There were cold waves predicted by the Chief Signal Officer on the 6th, 12th, 17th, and 24th; the predictions were fully verified.

The precipitation was above the normal 1.5 inches. The rain was very uniformly distributed over the month. Heavy wind, thunder, and hail storms

were reported by Mount Willing on the 10th, at 10.30 p. m., during a high pressure; by Newton on the 17th; and by Tuscumbia on the 16th, at 8 p. m., with a precipitation of 2.42 inches within thirteen hours. Tuscumbia also reported a strong wind on the 23d.

In the autumn just closed the temperature was 1°.9 below the normal, and the precipitation was 3.45 inches below the normal—indicating a dry autumn.

Summary.

Mean temperature, 52°.2; highest temperature, 84°, at Fayette, on the 3d; lowest temperature, 18°, at Gadsden, on the 19th; range of temperature, 66°; greatest monthly range of temperature, 56°, at Fayette; least monthly range of temperature, 36°, at Union Springs; mean daily range, 16°.3; greatest daily range of temperature, 49°, at Oswichee, on the 1st; least daily range of temperature, 0°, at Centre, on the 21st, and at Greenville, on the 12th.

Mean depth of rainfall, 5.03 inches; mean daily rainfall, 0.168; greatest depth of monthly rainfall, 11.55 inches, at Mount Willing; least depth of monthly rainfall, 3.27 inches, at Tuscaloosa; greatest daily local rainfall, 3.50 inches, at Mount Willing, on 17th.

Average nnmber of days on which rain fell, 9; average number of cloudy days, 10; average number of fair days, 9; average number of clear days, 11.

Warmest day, 23d; coldest day, 19th.

Prevailing directions of wind, south and southwest.

The following is an extract from the November, 1886, report of the "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

Districts.	Temperature.			Average precipitation.
	Highest.	Lowest.	Monthly means.	
	°	°	°	*Inches.*
Northern counties	73.0	11.0	36.2	2.96
Central counties	73.5	9.0	37.4	4.04
Southern counties	77.0	13.0	41.2	5.03
State	77.0	9.0	38.3	4.01

The mean temperature of the state for November, 1886, was 3° below the mean of November for the past five years; 2°.6 below the mean of sixteen years at Indianapolis; 1°.7 below the mean of thirty-one years at Logansport; 5°.5 below the mean of twenty-one years at Vevay; 0°.4 below the mean of thirty-three years at Spiceland; 0°.1 above the mean of seven years at Mauzy; 5°.4 below the mean of nine years at Blue Lick; 10.6° below the mean of five years at Worthington; 3°.1 above the mean of seven years at Lafayette.

The mean precipitation of the state for November, 1886, is 0.87 inch above the mean of November for the past five years; 0.32 inch above the mean of sixteen years at Indianapolis; 1.07 inches above the mean of thirty-one years at Logansport; 0.90 inch above the mean of twenty-one years at Vevay; 0.98 inch above the mean of twenty-eight years at Spiceland; 0.30 inch above the mean of seven years at Mauzy; 0.31 inch above the mean of five years at Blue Lick; 0.08 inch above the mean of five years at Worthington; 1.28 inches above the mean of seven years at Lafayette.

Frosts are reported on every day except the 3d, 9th, 10th, 11th, 12th, 17th, and 20th.

The high wind of the 18th was prevalent in the central and southern parts of the state.

The following is an extract from the November, 1886, report of the "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, of Springfield, director:

The state covers such an extended area from north to south (385 miles) that it has been found advisable to divide the same and follow the judicial divisions, which include the following territory, viz.: the northern division extends from 42° 30′ to about 40° 31′; the central division extends from about 40° 31′ to about 39°; the southern division from about 39° to 36° 51′.

Temperature.—The mean temperature of the state for the month, 38°.6, was 0°.6 below the normal for the past twelve Novembers. The mean temperature of the northern division was 35°; of the central division, 38°.8, and of the southern division, 41°.8. The temperature was below the normal in all but four of the sixty-three counties reporting. It averaged 1°.9 below in the northern division; 1°.3 below in the central division, and 1°.5 below in the southern division.

Saint Clair county, Saint Louis, Missouri, reported a departure of 2°.0 above the normal for the month; Coles county, Mattoon, 0°.3 above; Peoria county, Peoria, 0°.1 above, and Sangamon county, Springfield, the normal.

The greatest departures below the normal are as follows: McHenry county, Marengo, 2°; DeKalb county, Sycamore, 3°.7; Ford county, Melvin, 2°.3; Champaign county, Philo, 2°.3; Christian county, Pana, 3°; Crawford county, Palestine, 3°.1; Bond county, Greenville, 4°; Hamilton county, McLeansborough, 2°.6.

The highest temperature prevailed on the 1st and 2d, and the lowest on the 25th and 26th.

The highest temperature reported for the month was 78°, at Fairfield, Wayne county, on the 2d, and the lowest, 6°, at Camden, Schuyler county, on the 30th.

Precipitation.—The average precipitation for the state for the month was 3.04 inches; for the northern division, 1.28 inches; for the central division, 2.04 inches, and for the southern division, 5.45 inches. It was 0.07 of an inch below the November normal for the state; 1.10 inches below for the northern division; 0.73 of an inch below for the central division, and 1.35 inches above for the southern division.

The distribution of precipitation was very unequal throughout the state. Portions of the northern and central divisions dread the coming winter owing to the scarcity of water, while the southern division has a plentiful supply.

The most marked departures from the November normal are as follows: *Below the normal:* DeKalb county, Sycamore, 2.04 inches; La Salle county, Ottawa, 2.06 inches. *Above the normal:* Wabash county, Mount Carmel, 2.29 inches; Hamilton county, McLeansborough, 2.58 inches; Union county, Anna, 2.34 inches.

The snowfall averaged 5.9 inches for the state for the month; 1.8 inches for the northern division; 6.4 inches for the central division, and 8.9 inches for the southern division. The total snowfall for the month ranged from 0.5 inch in Livingston county, Pontiac, to 17.5 in Clay county, Flora. General snows fell on the 29th and 30th.

The greatest monthly precipitation reported was 8.40 inches in Lawrence county, Sumner, and the least, 0.50 inch in Menard county, Petersburg.

The following is from the advance bulletin (November, 1886) of the "Iowa Weather Service," Dr. Gustavus Hinrichs, director; central station at Iowa City:

November, 1886, was cold, northwesterly winds prevailing; precipitation was moderate, excepting one heavy snowfall in the northwest.

The mean temperature of the air was one and a half degrees below normal. During the last sixteen years November has been as cold or colder ten times, the coldest being that of 1880, which was eight degrees below normal. The first decade was nearly two degrees above normal; the second was fully that much below normal, and the third decade was very wintry, being nearly four degrees below normal.

The first half of the month was fair, warm, and dry, being one degree above normal; frosty mornings and hazy days were common; precipitation was very light and consisted of rain only. The last half of the month was cloudy, cold, and stormy, being three degrees below normal in temperature; heavy snow storms and blizzards occurred, completely stopping field work and temporarily blocking railroads in the north.

While cold, no extreme low temperatures were attained. At the central station the lowest temperature recorded this November was eight degrees above zero, while in November of 1871 and 1875 the thermometer descended to ten below zero.

The most remarkable storm of the month set in with northeasterly winds on the 15th, brought rain in the south and abundant snow in the north on the 16th, was marked by snow and high winds on the 17th, and followed by decidedly colder, clearing weather on the 18th.

The total precipitation was less than normal; at the central station only a little over one inch fell, which is but 42 per cent. of the normal amount. During the last sixteen years, only in 1875 and 1878 was the amount less than this. The entire eastern half of the state received only about one inch of water, while the west averaged over two inches of rain and melted snow. The highest precipitation, exceeding five inches of water, is reported from Onawa; the lowest, not quite half an inch, fell at Waterloo. The most abundant precipitation occurred in central-eastern Iowa on the 22d, throughout the balance of the state on the 16th and 17th.

The only thunder-storm of the month occurred on the 22d in northern Iowa; on this warm day a fog extended over nearly the entire state.

The following is from the November, 1886, report of the "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The mean daily temperature was generally above freezing until the 16th, when the first severe cold wave of the season moved southward from Manitoba and lowered the temperature throughout this region considerably below freezing, and below zero in the northwestern portion of the state. From the 16th the temperature continued low, while at the close of the month it was decidedly colder, being below zero south to Saint Paul. The mean temperature for the state was 26°.9, which is 5°.2 below that of the corresponding month of 1885, while the mean is but slightly lower than the average for a number of years. The greatest departure was 2°.0 below the average of sixteen years, and occurred at Saint Paul. At other stations the deviation from the normal did not exceed one degree. The range of temperature was very marked, while November, 1885, was distinguished by a slight range. The average range was 70°.5, while in November, 1885, it was but 40°.7. The stations having the greatest monthly range of temperature were Sherburne, Saint Paul, and Saint Vincent, where it was 80°.0, 76°.9, and 75°.7, respectively. Stations having the least range were La Crosse, 61°.1, and Winona, 63°. The maximum temperatures for the month occurred generally on the 1st; the highest was 73°.6, at Saint Paul, while the lowest observed was 17°.7 below zero, at Saint Vincent, on the 25th, thus making the range for the state 91°.3.

The precipitation was not regularly distributed, as in the extreme northwestern portion of the state the fall was but slightly over one-half an inch, which is about the average, while to the south, at Moorhead, there was an excess of 1.40 inches. In the eastern portion of the state the fall amounted to about two inches, which is an excess of one inch at Duluth, and 0.74 inch at Saint Paul. The average precipitation for the state was 1.69 inches, which is

nearly an inch more than the average of November, 1885. The greatest monthly precipitation was 2.84 inches at Duluth, and 2.72 inches at Rochester, while the least fall was 0.52 inch, at Saint Vincent, and 0.69 inch, at Morris. The greatest daily fall at any one place was 1.52 inches on the 16th, at Rochester. The greatest snowfall was 21.5 inches, at Red Wing. At the close of the month from 6 to 12 inches of snow remained on the ground.

The water in lakes, streams, and rivers is generally low, owing to the light rainfall of the past summer and fall.

The following is from the November, 1886, report of the "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

Summary.

Mean temperature, 53°; highest temperature, 81°, on 22d, at Vicksburg; lowest temperature, 27°, on 18th, at Batesville and Oxford; monthly range of temperature, 54°; greatest daily range of temperature, 39°, at Edwards, on 1st; least daily range of temperature, 4°, at Lamar, on 22d.

Mean monthly rainfall, 4.54 inches; greatest monthly rainfall, 8.89 inches, at Memphis; least monthly rainfall, 2.54 inches, at Loch Leven; average number of days rain fell, 9.

Thunder-storms were reported as follows: Oxford, 11th, 23d; Memphis, 16th; Loch Leven, 11th; Mobile, 17th.

Fogs were reported as follows: Oxford, 10th: Starkville, 3d, 4th, 9th, 10th, 11th, 20th; Loch Leven, 4th, 8th.

Meteors were observed at Oxford on the 15th.

Ice was reported at Lamar on the 18th; Loch Leven on the 18th and 26th; first ice at Oxford on the 7th.

The observer at Lamar reports a slight snow on the 18th.

The following is an extract from the November, 1886, report of the "Missouri Weather Service," Prof. Francis E. Nipher, Washington University, Saint Louis, director:

The mean temperature for November, 1886, has been 43°.6, it being nine-tenths of a degree below the normal for November at the central station. The coldest day during the month was the 25th when the thermometer registered 21° as the lowest temperature. The temperature fell to or below 32° on nine days during the month. The highest temperature, 73°.6, was observed on the 1st.

The rainfall at the central station, 3.87 inches, was nearly one inch in excess of the normal, which is 2.95 inches. About 1.34 inches of this fell in the form of snow during the second and third decades. Between six and seven inches of snow fell during the month. The first snow of the season fell on the 5th.

In the state the lowest temperatures observed were 4°.5 at Craig, and 10° at Kirksville and Mound City. The highest temperatures were 79° at Pro Tem and 78° at Greenfield and Louisiana.

The rainfall was greatest in the southeast part of the state, being over five inches at Cairo and Ironton; in the southwest and central parts it was between two and three inches, diminishing to about one inch in the extreme northern part.

Savannah reports the past month extremely dry, with high winds and frequent changes in weather.

Lamonte reports the past month as having been remarkably mild. Pansies were blooming out of doors on the 15th. Water very scarce, it being hauled fifty and sixty miles by the Missouri Pacific Railway.

The following is from the November, 1886, report of the "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

The range of temperature has been great, the highest being higher than for many Novembers past, and the lowest being lower than any since 1880. The mean temperature of the month has been slightly below the normal, and the precipitation somewhat above; almost the whole of it, however, fell in the form of snow during the severe storm of the 16th, 17th, and 18th. No such depth of snow has ever fallen in November heretofore since this service was organized.

Comparison of past Novembers.

The table shows the mean temperature, the noon temperature, and the number of days below 32° for the past nine Novembers in southeastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperatures and the lowest recorded anywhere in the state by standard self-registering thermometers:

November.	Mean temperature.	Noon temperature.	Below 32°.	Highest temperature.	Lowest temperature.
	°	°	*Days.*	°	°
1878	40.8	53.6	18.4		
1879	38.6	46.4	15.8	65.0	8.0
1880	25.3	34.6	24.2	66.0	— 7.0
1881	34.2	40.6	18.2	64.0	3.0
1882	38.3	46.2	20.7	73.8	2.0
1883	37.8	46.9	20.1	67.0	6.0
1884	37.2	46.6	21.3	69.2	1.9
1885	38.1	47.2	20.4	72.2	18.6
1886	33.8	43.3	24.3	74.5	— 5.0

The following table shows the precipitation, or depth in inches of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the depth of snowfall during the month:

November.	Precipitation.	Days of precipitation.	Cloudy days.	Clear days.	Snow.
	Inches.				
1878	0.73	1.6	3.1	16.3	
1879	2.63	4.7	6.7	14.6	
1880	0.70	4.0	4.1	15.9	3.1
1881	1.26	3.3	5.3	12.5	5.6
1882	0.82	2.8	3.1	15.7	0.6
1883	0.26	1.2	2.6	19.5	0.0
1884	0.17	2.2	5.6	10.8	0.7
1885	1.09	2.3	7.3	13.8	0.4
1886	1.26	4.5	6.8	16.2	10.5

The following is an extract from the November, 1886, report of the "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and forty-six observers.

The mean temperature and the precipitation of the month have been very generally above the normal. The cloudiness has also been in excess of the average.

The month was characterized by so many alterations from clear or fair to cloudy or rainy weather that it cannot be divided into less than fourteen alternating periods, although several of these are not strongly characterized by decided conditions.

Of these periods the weather conditions of New England were most affected by that covering the 17th, 18th, and 19th. The following description is given of this storm:

The 16th was followed by a sudden change, as the anticyclonic area moved away and left us under westward gradients directed to a well developed cyclonic storm central in Iowa on the morning of the 17th. Its approach was heralded by solar and lunar halos seen at many stations on the 16th; the 17th was cloudy, and rain began in the morning in Connecticut, and in the afternoon in Maine, lasting over night till the afternoon of the 18th. The rain was generally light at first, and began with northeasterly winds, suggesting the formation of a secondary low-pressure area to the south of the main storm-centre that followed the Saint Lawrence Valley; but about noon of the 18th, the clouds darkened with high, warm, southerly wind, heavy rain for an hour or two, and thunder and lightning; the latter arrived in western New England about 11 h.; in the Connecticut Valley, between 12 h. and 13 h.; in eastern Massachusetts, about 14 h.; in southwestern Maine, at 14.30; in Belfast, at 15 h. The southerly wind carried temperatures as high as 60° to 65° up to southern New Hampshire and Vermont, causing the maximum of the month at some stations; and in the shifts between this and other winds rapid changes of temperature were noted at several points. These were best determined by the self-recording thermographs at the summit and base of Blue Hill, where the coming of the warm wind was first felt on the summit, causing a strong inversion of temperatures (20° warmer at summit than base at 2.40 a. m.); this is not to be confused with inversions of temperature produced by local causes on clear, calm nights. The storm was followed by snow-squalls on the morning of the 19th, opening a period of fine weather, westerly winds, and moderate variations of temperature from the 19th to the 22d; the nights were generally frosty and were coldest on the 22d, when the pressure was highest.

The following is an extract from the November, 1886, report of the "New Jersey Weather Service," Prof. George H. Cook of the Agricultural College, New Brunswick, director:

The New Jersey State Weather Service has already fairly begun its work. Some forty persons throughout the different counties of the state have responded to the call issued for voluntary observers. Quite a number of these responses are from trained observers and a few are in possession of accurate and reliable meteorological records extending back a period of years. Other correspondents have called for instructions and forms with which to begin reporting, while still others are engaged in securing instruments, building shelters, and erecting observatories, preparatory to engaging in this pleasant work.

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The month was slightly warmer on the whole than usual. Ploughing was going on in Middlesex county on the last day. Of the seven severe storms that passed over the country during the month of November, only four markedly influenced the weather conditions throughout New Jersey. On November 6th the area of low pressure that developed the night before in West Virginia passed northeastward through Sussex county and caused general rains—accompanied in many places by thunder and lightning—which turned into snow as the wind veered to the westward on the morning of the 7th. This was followed by a decided fall of temperature, with killing frosts. The second storm experienced was due to a low area that passed northeastward across Warren, Sussex, Passaic, and Bergen counties early on the morning of the 13th, causing in some parts of the state the heaviest downpours of the month.

The third disturbance was due to a low barometer passing over the Lakes on the 17th and 18th. The weather conditions throughout the state were much disturbed as it passed eastward to the Saint Lawrence Valley and produced high winds and copious rainfalls at all stations on those dates. Another low pressure followed the same path five days later and caused precipitation at many places on the 23d. The most destructive storm, however, that occurred during the month came from North Carolina and passed during the afternoon and evening of the 25th across the state through the counties of Cape May, Camden, Cumberland, Burlington, Gloucester, Salem, Atlantic, and Ocean.

The passage of this eastward was followed by a cold wave from the Northwest, and the lowest temperature of the month was recorded throughout the state on the morning of the 27th. The rainfall mostly occurred inside of a limit of ten days and was quite uniformly distributed, the extremes being for the month 3.37 inches at Egg Harbor City and 5.03 at Clayton. The rainfall throughout the state was above the mean as compared with valuable tables of Prof. J. C. Smock. Two cold-wave warnings were received during the month, both of which were fully justified.

The following is an extract from the November, 1886, report of the "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, director:

The mean temperature was lower than that of either of the four preceding Novembers, being 38°.8. The five-year average is 40°.4, and the normal, 41°.6. The highest November maximum, 80°, was reached at Paulding on the 2d. The minimum, 11°, was not as low as usual, but the mean daily range was 1°.1 above the five-year average of 16°.8.

The mean rainfall was the greatest we have reached for November, being 4.23 inches. Our five-year average is 2.8 inches, and the normal for the state 3.26. The greater part of this rainfall occurred on the 6th, 12th, 17th, and 23d, on which dates the principal storms of the month passed over the state.

Summary.

Mean temperature, 38°.8; highest temperature, 80°.0, at Paulding, on the 2d; lowest temperature, 11°.0, at Ohio State University and Paulding, 27th and 16th; range of temperature, 69°.0; mean daily range of temperature, 17°.9; greatest daily range of temperature, 49°.0, at Paulding, on the 21st; least daily range of temperature, 3°.0, at New Alexandria, on the 23d and 30th.

Average number of clear days, 7.6; average number of fair days, 9.5; average number of cloudy days, 12.9; average number of days on which rain fell, 11.3.

Mean monthly rainfall, 4.23 inches; mean daily rainfall, 0.14 inch: greatest number of days on which rain fell, 16, at Levering and Hiram; least number of days on which rain fell, 6, at Newcomerstown; greatest rainfall, 6.73 inches, at Youngstown; least rainfall, 2.17 inches, at Pomeroy.

The following is an extract from the "Tennessee State Board of Health Bulletin" for November, 1886, prepared under the direction of J. D. Plunkett, M. D., President of the State Board of Health. The weather report is prepared by H. C. Bate, Director of the State Meteorological Service:

There were no very striking features in the weather during the month of November, except the rain storms of the 17th and 21st. Except in the item of precipitation, the conditions showed but little departure from the normal.

The mean temperature was 46°.2, which was slightly below the mean of the month for the past four years. The highest temperature, 80°, was recorded on the 2d, and was 2° below the maximum of the month for 1883 and 1885, and 4° above the maximum of the month for 1884. The lowest temperature, 12°, was recorded on the 14th, and was 2° above the minimum of the month for 1883, and respectively 5° and 6° below the minimum for 1884 and 1885.

The mean depth of rainfall for the month was 6.39 inches, which was considerably above the mean for the month in the past four years, and above the normal. Of this amount the eastern division received an average of about 5.75 inches, the middle division an average of nearly 6 inches, and the western division an average of a little more than 7.50 inches. This was quite a difference in the rainfall in these two latter sections from that of the month previous, the average then being only about .50 inch. The greatest rainfall was 8.89 inches, reported at Memphis, and was the greatest November rainfall at that station during the past fifteen years, except in 1875, when the rainfall measured 9.63 inches. The rainfall at Nashville and Knoxville for the month was also above the normal, the latter being the greatest reported for November during the past fifteen years. This was doubtless the case at many stations throughout the state. The greatest local daily rainfall was 3.96 inches, reported at Covington on the 21st, on which date quite a number of stations reported heavy rains. On the 17th also there were heavy rains reported.

Summary.

Mean temperature, 46°.2; highest temperature, 80°, on the 2d, at Dyersburg and Woodstock; lowest temperature, 12°, on the 14th, at Farmingdale; range of temperature, 68°; mean monthly range of temperature, 51°.1; greatest monthly range of temperature, 60°, at Riddleton; least monthly range of temperature, 44°, at Careyville, Bolivar, and Covington; mean daily range of temperature, 18°.9; greatest daily range of temperature, 48°, on the 1st, at Hohenwald; least daily range of temperature, 1°, on the 21st, at Trenton, and on the 30th, at Riddleton; mean of maximum temperatures, 73°.3; mean of minimum temperatures, 22°.2.

Average number of clear days, 11.2; average number of fair days, 7.7; average number of cloudy days, 11.1; average number of days on which rain or snow fell, 10.

Mean depth of rainfall, 6.39 inches; mean daily rainfall, 0.21 inches; greatest rainfall, 8.89 inches, at Memphis; least rainfall, 3.77 inches, at Waynesborough; greatest local daily rainfall, 3.96 inches, on the 21st, at Covington; days of greatest rainfall, 12th, 17th, 21st, 22d, 23d; day of greatest rainfall, 17th; days without rainfall, 14th, 19th, 28th; mean depth of snowfall, 0.03 inch.

Warmest days, 1st, 2d; coldest days, 8th, 14th.

THE EFFECT OF WIND AND EXPOSURE UPON BAROMETRIC READINGS.

The following paper was read at the recent Buffalo meeting of the American Association for the Advancement of Science by Prof. Cleveland Abbe, Assistant:

The influence of the wind on the barometer, which has been recently discussed in "Science," is a matter that has engaged the attention of several meteorologists, each apparently ignorant of what others have done in the same direction. My own attention was first called to this matter by the daily use of Robinson's and Lind's anemometers at Cincinnati in 1869, and again by phenomena attending a severe wind in Washington in 1875, after which I wrote to Prof. A. H. Mayer, of Stevens' Institute, who noticed similar phenomena. But it was not until I read, in 1877, the first paper by Hagemann on his new form of anemometer, that a suggestion arose as to the possibility of measuring and eliminating this effect. This method I have explained in two lectures on anemometry delivered in February, 1882, an abstract of which is given on page 96 of the Annual Report of the Chief Signal Officer for 1882.

The portable Lind anemometer is essentially composed of a Pitot tube in front, joined with a Hagemann anemometer or a Magius tube in the rear. These two separate instruments when thus united record only differences of pressure by measuring the height of a small column of water in the siphon tube that joins them. If now for the column of water and siphon tube, we substitute two aneroid barometers, one at the bottom of each of the vertical tubes which are now supposed to be closed below, we then have from the reading of the barometer at the bottom of the Pitot tube, whose opening faces the wind, the static barometric pressure in the free air plus the mechanical pressure caused by the wind; while from the aneroid at the bottom of the Magius tube we get the difference between the barometric pressure and the mechanical effect of the wind on the opening of that tube.

Until this or some equivalent device is made use of by meteorologists, our barometric observations must continue to be affected by a source of error that Col. Henry James has shown may be at times of more importance than any of those at present recognized.

It is only within a few days that I have seen Colonel James' memoir in the Edinburgh transactions for 1852 and, as the volume is rare, the accompanying abstract may be acceptable; I also add an abstract of a short paper by the Hon. Ralph Abercromby, published in 1875.

The problem of the meteorologist is, how to determine the elastic or static pressure existing within a mass of moving air by means of a stationary barometer. In general the pressure recorded by our mercurial barometers is affected by the wind and depends upon the following considerations:

(1.) A wind blowing across the cistern or the open leg of the siphon of a barometer out of doors, or past the open window or chimney top of the observing room, will diminish the pressure.

(2.) The aspect of the observing room and the location of the window or other aperture, such as the chimney flue, the doors, etc., the location of the window with reference to the centre or edge of the windward or leeward side of a large building, may cause either an increase or diminution of pressure.

On the leeward side of a building the relief of pressure during high winds is known to be very considerable at times. I have known of a case in Washington City where the window of a closed hall room was burst outward by the expansion of the enclosed air when a gale swept by; undoubtedly a similar relief exists on the leeward side of mountain tops. The distribution of the differences of pressure between the front and rear of thin, square, plane plates has been studied by Messrs Curtis and Burton ("Quarterly Journal of the Meteorological Society of London," vol. VIII, 1882, p. 139), whose results give us some idea of what might take place in large buildings. The diminished pressure within a closed cylinder when a current of air blows across its mouth or when it blows longitudinally past its mouth, the diminished pressure on a leeward side of a building, and that in the rear of a rapidly moving ball, are all examples of similar problems in the flow of gases past obstacles. In the case of a cannon ball the space close behind it is nearly a vacuum.

Beginning with Halley the idea has frequently been suggested that horizontal winds tend to relieve the objects beneath them from the vertical air pressure, and in this way he explains the low pressure during high hurricane winds. The only sense in which this explanation is correct is that such horizontal winds have a slight centrifugal force with respect to the earth's center and must, therefore, tend to counteract gravity, but only by an inappreciable amount. Experience shows that we can have high winds and high barometer at the same time. The low pressures ordinarily experienced, so far as they are due to the wind, are explained by the two principles that meteorology owes to Ferrel, namely the horizontal deflections due to the rotation of the earth and the circulation around a storm-centre.

Abstract of the memoir "On a necessary correction to the observed height of the barometer depending upon the force of the wind," by Capt. Henry James,